value. A series of great economic problems was forever in his mind: How can these inundated lands be regained? How can the broad fields of New Jersey be fertilized? How can the potter's art be developed from the clays of the coastal plain? How can the deposits of zinc be utilized by the industries of the State, and how can the great beds of iron-ore be transformed into the instruments of modern civilization? And he applied the principles of science to these problems. Geography, geology, paleontology, and chemistry were all made subsidiary to the leading purpose of his survey.

Science was thus made to bless mankind, and the advancement of science did not lose thereby; science and industry in copartnership were each strengthened; industries of great magnitude and value to the people were steadily developed; and science itself steadily grew under the genius of his guidance.

The State of New Jersey is the seat of ancient seas. From the sediments therein deposited the rocks of the hills of New Jersey were made. The history of New Jersey through long geologic time is a history of innumerable earthquakes consequent upon the upheaval and depression of its lands. At one period in its history it was the scene of vast volcanic activity, when molten rocks poured to the surface. Built by the sea, it has been fashioned by the storm, and the waves of ocean have carved its shores with a fretwork of beautiful forms. Its low shores, its coastal plains, its broad valleys, and its billowy hills have been carved by rains and rivers until it presents a landscape of beauty. These physical features of the State, which express its beauty, and record its history, and reveal its structure, became one of the great studies of Dr. Cook when he began the topographic survey of the State. He lived to see that survey completed; and he gave to the industries of the land and to the science of the world the first great topographic map of a State constructed on this continent. Had this been his sole contribution to the knowledge of the world, it would have made him worthy of high honor.

With the increase of population in this country the ordinary wells which gather the water from the surface steadily become polluted, and dangerous to health and life. With the multiplication of manufacturing establishments, and through other agencies ever on the increase, the streams become polluted, and their waters are freighted with disease. The supply of pure water for domestic purposes to the people of the State of New Jersey early attracted the attention of Dr. Cook. With profound insight into the physical structure of the State, he early became convinced that the hills of the highlands constituted a catchment area for the waters of deep-seated rocks in the lowlands; and that, through these pervious formations outcropping above, the waters were filtered and purified, and could be reached by artesian boring along the coast. His prophecy was fulfilled, and now the beautiful towns of the region are made salubrious through the genius of his scientific induction. To-day thousands of wells extending along our coast from New York to Florida pour out the pure waters of life, and bless multitudes of people, and make their homes happy. The clouds of the highlands are tributary to the cottages of the coast, and the rocks deeply seated in the foundations of the earth carry them on their way.

Through long years of his life Dr. Cook was engaged in investigations relating to agricultural industries. The interests affected by these investigations are vast, for they are at the foundation of all prosperity. The facts and principles to be investigated are multifarious and complex, relating to climate, to soil, to vegetal life and animal life, and the relations of all these to human life. Science has done much for modern industries in manufacturing, in mining, in transporting, and in commerce; the hidden powers of the world have been discovered and tamed; but science has done comparatively little for agriculture; and Dr. Cook was one of the founders of a vast system of research, which has now been established throughout the land on a comprehensive and symmetric plan. Through the agency of these founders, of whom Dr. Cook was one of the leaders, experiment stations have been established in every State of the Union, endowed by National and State grants, and the greatest army of investigators ever organized under the sun is now at work on the complex problems of agricultural science. This was the crowning labor of a long and fruitful life. It has been a quiet but vigorous and efficient movement, and the people do not realize what has been done. The labors in this cause, of this beneficent friend of mankind, were untiring. They were conducted among men of affairs, in the seats of learning, in State legislatures, and in the National Congress. Everywhere his benign influence was exerted and felt, his counsels were taken with delight, and he became a leader of men where only the wisest and best men could be led. His appeal was to scholars and statesmen, and the counsels of the old man eloquent ultimately prevailed.

From the early history of civilization until the present time, many great thinkers of the world have been constructing temples of philosophy. It began with Socrates, Plato, and Aristotle, and this temple-building has continued through the times of St. Thomas Aquinas down to Hegel, Schelling, and Fichte, and even later to the days of Herbert Spencer. These theorizing philosophers have attempted to construct systems for the explanation of all things of the universe, and to build their philosophy upon a few "fundamental principles,"—postulates, presuppositions,—to construct temples founded on their domes. One by one these great philosophies have crumbled into dust, and we know them only by their ruins. The history of civilization is marked by the ruins of fallen philosophies, now most interesting to historical archæology.

In modern times another philosophy is being constructed,—the great temple of science. On this structure a vast army of scholars are at work through the multifarious methods of scientific research, and they are building this temple with its foundation on the granite base of fact. George Hammell Cook was a master workman on this temple, built as it is being built out of the facts and principles discovered by modern scientific research.

I knew Dr. Cook best as a counsellor and a friend. Having responsibilities thrown upon me kindred to those borne by him, I was glad to seek wisdom at his feet. Honest and pure, he was wise and far-seeing, and for his counsel I owe a debt of gratitude. His ways were characterized by directness and simplicity, and I learned to love him as a father, and be guided by him as a son. And now the wise old man is gone. This fountain of wisdom flows no more. The processes of time and change never cease. On we go with the stream of events. Shall our lives also make the world better?

The light is from on high.

The powers of the earth come from the heavens.

They who have wielded these powers best are placed in the firmament of history.

The method of human progress is not through "the survival of the fittest," for man is more than the brute.

The agency for the progress of mankind is the influence of the fittest. In all ages this has been recognized, now clearly, now dimly. In harmony with its principles, those who have best served humanity have been placed on high among the stars of history, that the light of their immortal deeds may forever shine upon the pathway of mortal men.

George Hammell Cook is among the stars. On earth he loved justice and he rendered justice; he loved the truth and he sought the truth; and, dead, he lives again, the star of justice and truth. O venerable friend! your counsels were wise, and your example was beneficent. Shine on to illumine our way to the truth and the right with the light of the knowledge of the glory of God.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

On request, twenty copies of the number containing his communication will be furnished free to any correspondent.

The International Congress of Geologists.

I HAVE just seen a note of Professor Lesley's in your issue of June 13, in which he characterizes the statement of the May *Naturalist* regarding the action of the committee on organization

of the International Geological Congress as erroneous. In the June number of the *American Geologist*, p. 386, will be found an accurate print of the official type-written notes of that meeting by the secretary, Professor H. S. Williams, signed by him, and sent to me with the request for my vote on the question of appealing to the bureau to change the place of meeting. This official statement establishes, first, that of those present, Powell, Dutton, Gilbert, Hague, Marsh, Walcott, and Williams were officers of the United States Geological Survey, and Cope, Hall, Lesley, Stevenson, Whitfield, Winchell, and Frazer were not. The above comprised all who were present. Of those who were not members of the United States Geological Survey, Lesley, Stevenson, Whitfield, and Winchell voted for the submission of the question to the bureau.

Capt. Dutton of the United States Geological Survey did not vote. If the vote was as stated, 9 to 3, who constituted the nine? Professor Lesley rightly says Hall, Cope, and Frazer voted "no."

So much for the vote being carried by the members of the United States Geological Survey.

Major Powell moved that "it is the opinion of the committee that the place should be changed" (see the secretary's official notes). I was also present at the meeting, and can testify to the accuracy of the secretary's notes. Major Powell did *not* oppose the selection of Washington, but remained silent while it was voted.

Only after the meeting was it given out that Major Powell did not wish the congress to come to Washington. He certainly did *not* urge "that nothing be done by the committee to cause such an action abroad" (i.e., the change).

Both Major Powell and the writer of the above note emulated Shakspeare's Julius Cæsar in putting off the crown, but, like that hero, ended by accepting it. PERSIFOR FRAZER.

Sea Girt, N.J., June 30.

BOOK-REVIEWS.

A Handbook of Descriptive and Practical Astronomy. II. Instruments and Practical Astronomy. By GEORGE F. CHAMBERS. 4th ed. New York, Macmillan, 1890. 8°. $5.25.

PROBABLY at no time have there been so many amateur astronomers with good telescopes as at present, and for all these would-be astronomers this book on astronomical instruments and their use will have an interest.

Chambers's "Astronomy" calls for no introduction to public attention at our hands, as the fact that this is a fourth edition testifies; but it may be well to repeat, what we announced when noticing the first volume of this new edition some weeks since, that the revision this time will result in the production of several distinct volumes, each treating of some special phases of astronomical science. It is thus that the present volume is limited to instruments, their employment in observations, and the proper mounting and housing of them.

Every one who knows the possessor of a good telescope knows how desirous this possibly happy personage is to have his instrument where it can be used. To meet this very want, our author has introduced a number of plans for small observatories, suggested not only by his own experience, but also by that of several of his professional friends. We feel sure that these will be eagerly sought by the amateur astronomers of this country, as well as by those of Great Britain, for whom they are specially intended.

But it must not be supposed that America has been neglected, for good descriptions are given of some of our newest and best observatories.

One chapter is devoted to a history of the telescope, which gives a completeness to the work, and is likely to furnish answers to the queries of many a questioning visitor.

The use of the spectroscope in astronomical work, which has led to so many important results, and which has so much fascination for those who have not the time to follow up the older astronomy, is cared for in several chapters.

We commend this book, and trust its use may help a few on this side of the water to a more intelligent use of their time and their opportunities, so far as they have available instruments, in developing some really important investigation in astronomical physics. The play of seeing more clearly than with the naked eye the features of the "man in the moon" soon ceases to give pleasure, and bears no proportion to the real delight of securing some small addition to the world's stock of knowledge, which can be had as the result of some intelligent work. Let those who wish for this delight secure a copy of the book here noticed, that they may know more of what is within their reach.

The True Grasses. By EDUARD HACKEL. Tr. by F. Lamson-Scribner and E. A. Southworth. New York, Holt. 8°. $1.50.

THIS is a good translation of Professor Hackel's valuable contribution to *Die natürlichen Pflanzenfamilien*, that great German publication on the natural families of plants edited by Dr. Engler and Dr. Prantl. As Professor Hackel stands among the foremost agrostologists, his work, expressing as it does the latest and most authoritative views upon the subject, is especially valuable; and, as it contains so much that is of practical importance, we are glad to see it made available to English readers.

The work embraces the grass family as a whole, and enumerates the best-known economic species and their uses. It discusses the structure and morphology of the grasses and their arrangement into tribes and genera, and points out their characters in a manner that will enable one to classify readily any grass that may come into his hand. For the benefit of persons unfamiliar with botanical keys, an illustration of the manner of using the keys of analysis is given in a brief introductory chapter; and a full glossary and index are appended, adding much to the usefulness and value of the work, especially for private students and general readers. The illustrations, of which there are upwards of a hundred, are mainly reproductions from the originals in the German work, though a few were drawn especially for this translation.

The Elements of Machine Design. 11th ed. By W. CAWTHORNE UNWIN. New York and London, Longmans, Green, & Co. 16°. $2.

THIS admirable and unique treatise on the elements of the work of the mechanical engineer designing machinery has now been in use in schools and offices on both sides the Atlantic for some years, and has been repeatedly revised and continually extended, until, from a little volume of perhaps three hundred pages, it has grown to two volumes of larger extent; and a third part is more than half promised by its distinguished author. It is attempted by its writer to give a fairly complete account of the methods of proportioning parts of machinery, and especially of that representative machine the steam engine, such as are in use in the best practice of the most successful builders, and such as are at the same time sanctioned by the best scientific authority. The work is in some respects, in English, a counterpart of that of Reuleaux in the German; but it is more directly adapted to the needs of the practitioner, and the custom and practice of the shops. It is a success, as is well indicated by the extent to which it has been adopted as a handbook and as a text-book, and by its rapid sale.

It gives a concise account of the materials used by the engineer; describes the various straining actions met with in machines; exhibits the results of research and experience as to straining action in structures and elements of machines; summarizes the results of latest experiments upon the strength of the several kinds of riveted joints, as used in boiler-work; determines the proportions of bolts, keys, and other connecting pieces, of journals and pins, and shafts and gearing. The principles of friction are applied in the determination of the proper proportions of bearings, and to the measurement of the efficiencies of machinery; while belting and rope transmission are given extended study. The second volume will deal with the details of parts of engines and machinery, and is promised for some time during the coming season. The third part will be devoted to the design of complete machines.

The book is brought up to date in a very satisfactory manner. The chapter on riveting is given large extent, and includes the results of the experiments of its author on riveting, as reported to the Institution of Mechanical Engineers. That on friction is the